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CLAIMS

What is claimed is:

1. A method for reducing or preventing contamination or oxidation of copper surfaces included in semiconductor process wafers comprising the steps of:

providing a semiconductor wafer including copper features having newly formed process surfaces following a semiconductor manufacturing process forming the newly formed process surfaces;

exposing the process surfaces to an alkaline solution for a period of time sufficient to chemically modify the newly formed process surfaces prior to substantial exposure of the process surfaces to a contaminating or oxidizing atmosphere; and,

placing the semiconductor wafer in a semiconductor wafer holding environment in queue for subsequent semiconductor manufacturing processes.

2. The method of claim 1, wherein the semiconductor manufacturing process includes at least one of copper seed layer deposition, copper layer electrodeposition, and copper chemical mechanical polishing.

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3. The method of claim 1, wherein the step of providing a semiconductor wafer includes a semiconductor wafer having residual sulfur containing contaminants.
4. The method of claim 1, wherein the alkaline solution has a pH of from about 7.5 to about 9.5.
5. The method of claim 4, wherein the alkaline solution includes deionized water and at least one ammonia free base.
6. The method of claim 5, wherein the at least one ammonia free base includes sodium hydroxide.
7. The method of claim 1, wherein the step of exposing the process surfaces to an alkaline solution includes at least one of a dipping and spraying process.
8. The method of claim 7, wherein the dipping process is carried out with simultaneous application of megasonic energy and the spraying process carried out with simultaneous spinning of the semiconductor wafer.

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9. The method of claim 1, wherein the step of exposing the process surfaces to an alkaline solution is carried out substantially immediately following formation of the newly formed process surfaces.

10. The method of claim 1, wherein the period of time is from about 30 seconds to about 120 seconds.

11. The method of claim 1, wherein the step of placing the semiconductor wafer in a semiconductor wafer holding environment includes placing the semiconductor wafer in a hermetically sealed container supplied with an inert gas purge.

12. A method for reducing or avoiding contamination or oxidation of copper surfaces included in semiconductor process wafers comprising the steps of:

providing a semiconductor wafer including copper features having exposed process surfaces following a semiconductor manufacturing process exposing the process surfaces; and,

subjecting the exposed process surfaces substantially immediately following the semiconductor manufacturing process to an ammonia free alkaline solution for a period of time sufficient to at least partially hydroxylate the exposed process surfaces.

13. The method of claim 12, wherein the semiconductor manufacturing process includes at least one of copper seed layer deposition, copper layer electrodeposition, and copper chemical mechanical polishing.

14. The method of claim 12, wherein the alkaline solution has a pH of from about 7.5 to about 9.5.

15. The method of claim 14, wherein the alkaline solution includes deionized water and at least one ammonia free base.

16. The method of claim 15, wherein the at least one ammonia free base includes sodium hydroxide.

17. The method of claim 12, wherein the period of time includes a time period of from about 30 seconds to about 120 seconds.

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18. The method of claim 12, wherein the step of subjecting the exposed process surfaces includes at least one of a dipping and spraying process.

19. The method of claim 18, wherein the dipping process is carried out with simultaneous application of megasonic energy and the spraying process carried out with simultaneous spinning of the semiconductor wafer.

20. The method of claim 12, further including the step of placing the semiconductor wafer in a semiconductor wafer holding environment including a hermetically sealed container supplied with an inert gas purge.